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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/452,844	12/03/1999	IVO RAAIJMAKERS	ASMEX.256A	1825

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EXAMINER

ROCCHEGIANI, RENZO

ART UNIT PAPER NUMBER

2825

DATE MAILED: 10/31/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/452,844

Applicant(s)

RAAIJMAKERS ET AL.

Examiner

Renzo N. Rocchegiani

Art Unit

2825

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 August 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-30,33-35 and 55-63 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-8,11-15,17,18,20-30,33-35,55-59 and 61-63 is/are rejected.
- 7) ☒ Claim(s) 9,10,16,19 and 60 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 29.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 3, 8, 11-15, 17-18, 20-27, 30, 33-35, 55-58, and 61-63 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,335,240 B1 (Kim et al.).

Kim et al. disclose a process to form a capacitor with a three dimensional structure with HSG surface (col. 4, lines 60-65) whereon a high k dielectric material is deposited with or without a silicon nitride or silicon oxide barrier layer deposited prior to the deposition of the high k dielectric. (col. 4, lines 42-50). The high k dielectric layer being deposited via an ALD process using a metal halide such as aluminum chloride or an organic metal compound such as methyl-aluminum. (col. 5, lines 55-65). The ALD process depositing one layer of material at the time, first being the metal layer and then forming an oxide of said deposited metal layer by exposing to an oxidizing species, thereby forming an aluminum oxide layer. (col. 5, lines 55-65) The ALD process is repeated to form a layer of desired thickness, i.e. a layer that falls within the range of 10 and 300 angstroms. (col. 5, lines 50-54). The ALD is performed at a temperature of

Art Unit: 2825

approximately 350 degree C. (col. 5, lines 55-64). Once the high k dielectric layer is formed, a second conductive material such as a metal nitride is formed thereon. (col. 4, lines 50-57).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 3-7 and 28-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,335,240 B1 (Kim et al.) in view of U.S. Patent N. 6,270,572 (Kim et al) (hereafter Kim2).

As stated in paragraph 2, all the limitations of the claims have been met except for specifying the deposition of the second metal layer; i.e. the deposition of the metal nitride over the high k dielectric layer and for teaching the use of a carrier gas and the purging the chamber after the formation of each mono-layer.

Kim2 teaches that a metal nitride layer may be deposited via and ALD process wherein the reactants include ammonia. (col. 6, lines 35-42). Kim2 also teaches that during the ALD process the chamber is purged between each layer deposition. (col. 3, lines 9-13) and the use of a carrier gas (col. 5, lines 48-55).

It would have been obvious to one having ordinary skill in the specific art to combine the teachings of Kim2 with the disclosed invention of Kim et al., since Kim et al. already discloses the formation of a metal nitride layer over the high k dielectric

Art Unit: 2825

material and Kim2 teaches a way to form such meal nitride in a controlled manner to produce a high density film that does not have pinholes. (col. 1, lines 35-57)

5. Claim 59 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,335,240 B1 (Kim et al.).

As stated in paragraph 2, all the limitations of the claim have been met except for specifying that the second oxidizing agent is different from the first oxidizing agent.

Kim et al. discloses a preference for H₂O as an oxidizing agent but does not limit the reactant to H₂O and instead broadly employs an oxidizing species. (col. 5, lines 45-60).

It would have been obvious to one having ordinary skill in the specific art to use a different oxidizing agent, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

Allowable Subject Matter

6. Claims 9-10, 16, 19 and 60 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion


1. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Renzo Rocchegiani whose telephone number is (703) 308-5839. The examiner can normally be reached on Monday through Friday from 8:30 am to 4:30 pm.

Art Unit: 2825

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith, can be reached at (703) 308-1323. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

RNR

October 20, 2003



MATTHEW SMITH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800